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$R_A$ km $s^{-1}$ $10^{43}\, erg\, s^{-1}$ DEF $F_{DEF}$ A&AS Nature

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The HI Content of Spirals. II. Gas Deficiency in Cluster Galaxies

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abstract We derive the atomic hydrogen content for a total of 1900 spirals in the fields of eighteen nearby clusters. By comparing the HI deficiency distributions of the galaxies inside of and outside of one Abell radius () of each cluster, we find that two thirds of the clusters in our sample show a dearth of neutral gas in their interiors. Possible connections between the gaseous deficiency and the characteristics of both the underlying galaxies and their environment are investigated in order to gain insight into the mechanisms responsible for HI depletion. While we do not find a statistically significant variation of the fraction of HI-deficient spirals in a cluster with its global properties, a number of correlations emerge that argue in favor of the interplay between spiral disks and their environment. In the clusters in which neutral gas deficiency is pronounced, we see clear indications that the degree of HI depletion is related to the morphology of the galaxies and not to their optical size: early-type and, probably, dwarf spirals are more easily emptied of gas than the intermediate Sbc–Sc types. Gas contents below one tenth, and even one hundredth, of the expectation value have been measured, implying that gas removal is very efficient. The radial extent of the region with significant gas ablation can reach up to 2. Within this zone, the proportion of gas-poor spirals increases continuously towards the cluster center. The wealth of 21-cm data collected for the Virgo region has made it possible to study the 2D pattern of HI deficiency in that cluster. The map of gas deficiency in the Virgo central area points to an scenario in which gas losses result from the interaction of the disks with the inner hot intracluster gas around M87. We also find evidence that gas-poor spirals in HI-deficient clusters move on orbits more radial than those of the gas-rich objects. The implications of all these results on models of how galaxies interact with their environment are reviewed. Hydrodynamic effects appear as the most plausible cause of HI removal.

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